

Dear Ms. Jackson,

Our beautiful state is under a dire and imminent threat of environmental devastation. Please read the enclosed articles that have just appeared in the current issue of Gly Fisherman magazine. Then ACT!

Ignorance is not bliss! The question is very simple: Will we stand idly by while dogmas of natural gas drilling companies poison our air, pollute our water and decimate our private and public lands with virtual impunity? Will New York State follow the same tragic path that is now destroying much of Pennsylvania?

Only a massive outpouring of opposition can prevent such an unthinkable tragedy. Please join the growing chorus of those saying "NO!" to hydrofracking. Tell your local, state and federal representatives that we cannot allow this unconscionable destruction of our fragile environment.

Ex. 6 - Personal Privacy

[In the Sept. 2009 issue, John Randolph in his page 2 article "The Threats Posed by Marcellus Drilling" identified "the single largest threat to Pennsylvania (also New York, West Virginia, and Ohio) wild-trout streams since the coal/steel era of the Industrial Revolution." After that issue went to subscribers, a "total" fish kill on 43 miles of Dunkard Creek in Pennsylvania raised the question again: "Is the Commonwealth of Pennsylvania protecting its waterways?" THE EDITOR.]

Fracking our Rivers

Investigating the causes of the Dunkard Creek fish kill

▲ DEBORAH WEISBERG

► Sixteen of George Watson's black Angus cows died mysteriously along the banks of Hargus Creek in the Monongahela River watershed. The deaths are just a glimpse of larger problems across Pennsylvania that may be the result of excessive levels of total dissolved solids (tds) in the water.

ON CHRISTMAS DAY 2007, George Watson returned home from a family dinner to find one of his prized Black Angus cows dead alongside Hargus Creek, a stream that runs through his southwestern Pennsylvania farm.

Over the next three months, Watson lost 16 more cattle—all of which had been bred—making it, as he said, "a double loss." Up to three in one day were found lying near the water. A series of calves died soon after birth.

"I've been raising cattle for 22 years and never had anything like that," said Watson, a Vietnam veteran, who also was having problems with discolored, sludgy well water. A local vet tested the dead cows, but failed to find anything abnormal. Looking back now, Watson wishes he'd had someone test the water in the creek.

Although natural gas wells were being developed all around him, rumors of illegal wastewater dumping in local streams, and a 43-mile fish kill on Dunkard Creek in the same Monongahela River watershed two years later, fueled his darkest fears.

"After my cows died, I suspected it was from brine and waste being dumped, although I can't prove it now," said Watson, who later leased the mineral rights on his farm to Range Resources for \$3,000 an acre plus 15 percent production royalties. Drilling hadn't begun as of late last year.

Range is one of 40 companies driving the boom in hydraulic fracturing for natural gas in Pennsylvania, where 53,000 wells are turning pastures and woods into

Photo | Deborah Weisberg



industrial sites. Although hundreds of thousands more have changed the landscape in at least 31 states, Pennsylvania and New York have an abundance of Marcellus Shale wells and, unlike out West, they are close to end users. While vertical drilling and "hydrofracking" for gas has existed for decades, new technologies enable extractors to go more than a mile deep and a mile horizontally to fracture the Marcellus—and release embedded gas—using millions of gallons of sandy, chemical-laden water.

Dunkard Fish Kill

CONSOL Energy's Morris Run borehole and other sources in the Dunkard watershed are under investigation by several federal and state agencies, including the Pennsylvania Attorney General's Office, over possible illegal discharges of hydraulic fracturing fluid, since the level of total dissolved solids, including chlorides, in Dunkard Creek was higher than anything previously associated with coal bed methane wastewater, the only discharge permitted at Morris Run.

"There's pretty strong evidence there was more than coal bed methane water going down that borehole," said Charlie Brethauer of Pennsylvania DEP's water management section. "As far as allegations of illegal activity, I think there's something to it, although to what extent, we don't have any idea yet. We haven't ruled out 'fracking' fluid."

Ed Pressley and his wife Verna live along Dunkard Creek in Brave, Pennsylvania, and watched in horror as fish began going belly up in September 2009 in what would become a massive loss of wildlife that continued for a month. The shells of rare mussels popped open, said Verna, and muskellunge and smallmouth bass bled to death from their gills.

"Kids were putting fish into buckets trying to save them—the tears were running down their cheeks—but there was nowhere to take the fish to," said Verna, a retired science teacher. "We counted 600 dead fish—the stench was overwhelming—just below our dam. It was one of the most devastating emotional experiences of my life."

What made it especially heartbreaking for the Pressleys is that their dream was to turn their property into a living classroom, where children could study kingfishers, blue herons, mudpuppies, turtles, and other forms



Photo: Deborah Weisberg

▶ Verna and Ed Pressley watched in horror last September as every fish in Dunkard Creek went belly up.

of wildlife sustained by the water. They were negotiating a conservation easement agreement with the US Department of Agriculture that would protect their land against development for generations to come, and with American Rivers to have a relic industrial dam removed from their section of the stream.

"The folks at Agriculture and American Rivers say they're going to stick with it," Verna said as she stood along Dunkard and peered into the eerily empty water last fall. "But it's going to be years before you'll see fish in here again. I know it's not going to happen in my lifetime."

An EPA interim report about Dunkard's demise cites the presence of golden algae, a toxic organism indigenous to southern U.S. coastal waters, but never before documented in Pennsylvania. Whether it got to Dunkard on migratory birds' feet, drilling equipment that originated in Texas, or by some other means may never be known, but the EPA confirmed that excessive levels of total dissolved solids turned Dunkard so salty the algae were able to thrive.

Golden algae was later found on Whitely Creek, a stocked trout fishery in the same watershed, said Brethauer, who indicated it is likely to spread to other streams.

While the gas drilling industry touts hydraulic fracturing as America's path to energy independence—the Natural Gas Supply Association claims there are enough reserves to meet the nation's needs for a century—some watchdogs say weak regulations and poor enforcement are fueling an

environmental nightmare.

The 2005 Energy Policy Act exempts injection of hydraulic fracturing fluids from a key provision in the Safe Drinking Water Act, and federal regulations governing wastewater disposal are limited, according to Deborah Goldberg of Earthjustice, a nonprofit environmental law firm. "Gas wastewater treatment is mostly left to states to regulate and monitor, and most states are way behind the curve."

Ron Bishop, a biochemistry lecturer at SUNY College at Oneonta and a nationally certified chemical hazards management expert, put it this way: "You have to go through more permitting hoops to put a new garage on your property than to drill for gas."

Pennsylvania is in the process of tightening limits on total dissolved solids that can be discharged in rivers and streams, and New York is considering new permitting requirements—generating a de facto moratorium on drilling—although many environmental stakeholders, including New York City, say they aren't strong enough to protect watersheds such as the Delaware River, which provides drinking water to 17 million people.

"Government has to ramp up its regulations tremendously," said Jeff Zimmerman, an attorney for Damascus Citizens for Sustainability and Friends of the Upper Delaware River, groups which formally have protested the New York proposal. "Until an environmentally infallible extraction system can be assured without qualification, the gas drilling industry should not be allowed to operate. It must be fail-safe. A single mistake or uncontrolled

accident can wipe out, for years and years, important resources, such as those of Dunkard Creek."

Federal lawmakers are also considering legislation—the Fracturing Responsibility and Awareness of Chemicals (FRAC) Act—that would reverse the Clean Water Act exemption and force industry to disclose the names of all of the hundreds of chemicals used in the hydrofracking process, including those traditionally guarded as proprietary information. Pennsylvania makes the names of chemicals available, but not the proportions.

"Some of them are really nasty, like toluene and benzene, which are known to cause cancer," said Bishop. "Others are harmful to wildlife. DB-NPA is a biocide commonly added to fracking water to kill bacteria and algae. Even in amounts too tiny to show up on chemical tests, it's lethal to bay oysters, water fleas, and brown trout."

The staggering volume of fracking fluid used in each horizontal well—up to 6 million gallons of water and 50,000 pounds of chemicals—means environmental impacts can occur on a massive scale, Bishop said. Spills at drill sites and well casing failures—the two most common problems associated with hydrofracking—can cause escaping fluids to contaminate ground and surface water, and gas to migrate underground.

Violations

PADEP cited drillers for more than 450 violations last year. Cabot Oil Co. was charged with a series of spills that polluted a wetlands and killed fish in Stevens Creek, a Susquehanna River tributary in northeast Pennsylvania.

In a separate matter, Cabot is being sued by 15 Dimock residents who claim drilling operations contaminated their drinking water and caused them to suffer neurological and gastrointestinal ills. They are seeking a halt to drilling plus establishment of a trust fund to cover their medical care.

[On Jan. 9, 2010, PADEP also announced it had fined Atlas Resources \$85,000 for violations at 13 different well sites in Greene, Fayette, and Washington counties. The violations included failure to restore well sites after drilling, failure to prevent discharges of silt-laden runoff, and for discharging industrial waste including production fluids onto the ground at 7 of the 13 sites. THE EDITOR.]

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Among the many environmental threats or impacts associated with hydrofracking—including huge withdrawals of water from lakes and streams and erosion and sedimentation from truck traffic on rural roads—one of the more concerning is disposal of wastewater, since about half the liquid used in fracking flows back with additional toxins, including brine six times saltier than ocean water, Bishop said. "This hazardous, industrial waste must be disposed of, but there's no good answer as to how or where. Texas and Oklahoma allow deep well injection, but it doesn't work in Pennsylvania and New York because our rock 10,000 feet down isn't porous enough to absorb the waste."

Before water can be discharged into streams it must be strained, desalinated and restored to an acceptable pH level, but few sewage treatment plants are equipped to deal with the volume and chemical composition of fracking water, and many streams have reached their capacity for assimilating more total dissolved solids, Bishop said. "It's a gigantic problem."

Chris Tucker of Energy In-Depth, a coalition of trade groups managed by the Independent Petroleum Association of America, agrees wastewater disposal is one of the industry's biggest bugaboos.

"Everyone knows we have to get on top of it," he said. "Producers are taking a lot of the wastewater from Pennsylvania into Ohio for deep-well injection. The industry is also

looking at mobile recycling facilities, but they're getting quoted one cent a gallon. Consider what that would cost when you're dealing with 3 or 4 million gallons of water."

Although Range Resources' CEO John Pinkerton insists that his company's wastewater poses no threat to freshwater streams, Range has turned to recycling in Pennsylvania, where one-acre impoundments and miles of above-ground pipes circulate frack wastewater among several wells. Range also is exploring additional technologies, including crystallization and evaporation—essentially boiling wastewater and skimming off the salt which could be sold for road de-icing.

"We don't know how much Marcellus play there will be but wastewater disposal will keep pace. If it doesn't, the drilling will cease," Pinkerton said. "We have millions of dollars invested in each well. We have to know where every gallon coming out of the ground will go. It's in our best interest to do it right. To do otherwise would be business suicide."

As a fly fisher, Pinkerton considers himself an environmentalist, and he said natural gas extraction is the only practical alternative to foreign oil and coal. "The idea that we can go to 100 percent renewables before you and I pass away is ludicrous. We need a portfolio of energy solutions—a balanced energy policy—so if oil goes to \$300 a barrel, we're not stuck. If we don't figure this out, we're dead meat."

He said every industry has risks and impacts—"you've got to cut down trees to print your magazine," he said—"but temporary inconveniences are necessary for tremendous, long-term gain, unless we all want to walk or ride horses to work."

Both Pinkerton and Tucker decry direct EPA permitting, which the FRAC Act would require. "It wouldn't just slow us down, it would bring us to a stop for four or five years," said Tucker, who points to the job growth he claims his industry has spawned. "We put 48,000 people to work in Pennsylvania and zero in New York because of the de facto moratorium. Where I come from, Wilkes-Barre/Scranton, gas is a godsend for folks who are economically depressed."

Fly fishing guide Glenn McConnell said he felt better about leasing the mineral rights to his land in the Pennsylvania Wilds after Range agreed to address Trout Unlimited.

"The drillers are just as concerned about the environment as you and me," McConnell said. "They don't want to make a bad name for themselves. If something isn't right, they'll correct it immediately."

PA Council Trout Unlimited environmental chair Greg Grabowicz is more focused on problem prevention. "We want assurances that operations will be fail-safe. Our immediate concern is whether DEP can enforce even existing regulations, with such a small staff and so many wells," said Grabowicz, a professional forester. "There's no doubt Pennsylvania's watersheds will change dramatically over the next 30 years from new roads and pipelines, but only time will tell if drillers run into problems that cause catastrophes."

Others, though, already have seen impacts to their favorite coldwater fisheries, including Sam Harper, the DEP water management program chief monitoring Dunkard, who has a camp in the Allegheny National Forest. "There's been a dramatic change in the South Branch of Tionesta Creek, where I fish," he said. "We're seeing a lot fewer brook trout and a lot more roads leading to wells."

And there are likely to be more impacts to woodland streams as ozone from diesel-powered trucks and drilling equipment cause leaf burn and deforestation, according to Al Appleton, a former New York City Department of Environmental Protection commissioner, who serves as technical advisor to Damascus Citizens.

Appleton said too little is also made of the millions of gallons of water sucked from lakes and streams for each hydrofracking operation.

"They may not impact flow during certain times of the year, but drilling isn't a seasonal business," he said. "These companies are withdrawing significant amounts of water constantly."

While PADEP raised drilling permit fees last year to help pay for more site inspections, it also streamlined the permit approval process to 28 days with completion of a basic application—even though the agency admits the need to put more teeth into existing regulations. "Environmentalists focus on wastewater, but the biggest issue for us is what happens at the site," said PADEP spokesman Tom Rathbun. "Is the well 'cased' properly? Are the water pipes built properly?

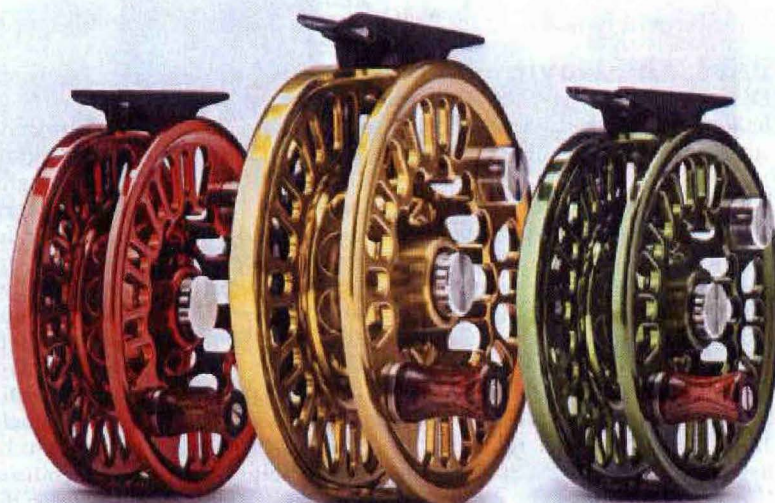
What about how trucks are crossing streams? That's where our focus needs to be."

In the meantime, lawmakers expect to hold hearings on hydrofracking and to request an EPA study on its effects on the environment, according to Kristopher Eisenla, an aide to FRAC Act co-sponsor Congresswoman Diana DeGette (D-Colorado). "The industry has had a free ride for so long,

if greater oversight costs it a few more bucks, in the interest of public health, it's worth it." —

Deborah Weisberg is an award-winning journalist whose work appears in the *Pittsburgh Post-Gazette*, *New York Times*, *BASS Times*, and other publications. She lives in Pittsburgh, Pennsylvania, and is a frequent contributor to *FLY FISHERMAN*.

TROUT TRIO



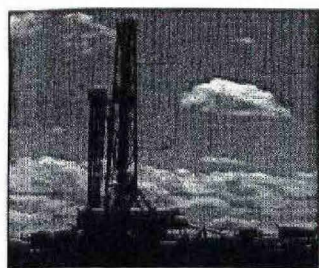
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New High Volume Slick water Hydrofracturing (fracking) is different. Since the 1990's, shale formations have been fracked using 3 million—7.8 million gallons of fresh water and 130,000—280,000 lbs. of chemicals. *The new style of fracking uses 40—200 times more toxic fluid than the old style of drilling.*

More Toxic Wastewater: Up to 16 Marcellus shale wells can be drilled per square mile. If an average of 100 times more fluids (than old style wells) are used per well, the wastewater generated per square mile will be equal to 1,600 old style wells in that same square mile. 65% of the 300 (or more) chemicals currently used in the fracking process are hazardous to health and the environment. Hydrofracking also brings to the surface radioactive materials, brine, methane, heavy metals, and other potentially hazardous chemicals.

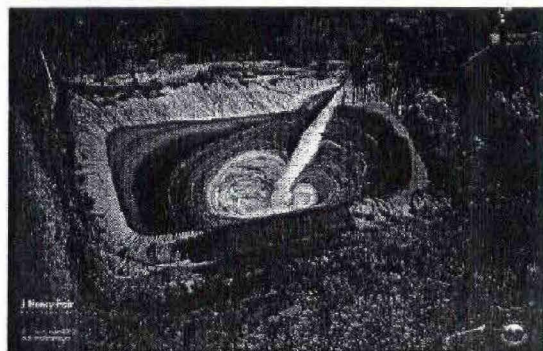
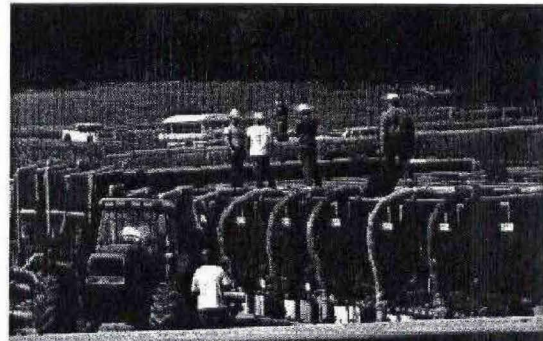
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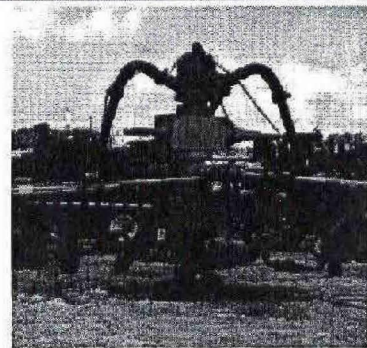
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Accidents Happen: The gas industry admits that accidents happen. Typical accidents that have happened in other states are: spills from trucks & storage containers • pipeline breaks • flowback fluid spills • seeps from faulty well casings • spills from faulty hoses • leaks from high pressure pumps • gas rig & pipeline fires & explosions.

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(Drilling fluid splashing past the liner, Dimock, PA, Spring 2009)



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How Green is Natural Gas?

Natural gas is widely touted as a “green” source of energy because it releases fewer greenhouse gases (GHG) than does coal *when it is burned*. Obtaining natural gas, however, causes the emission of significant amounts of heat-trapping GHG during exploration, extraction, processing, and transmission. As detailed below,

Drilling the Marcellus Shale may actually **increase** New York's carbon footprint, not reduce it.

compared to conventional extraction, even more GHG are emitted when gas is obtained by intense horizontal drilling and high-volume hydraulic fracturing (HVHF). Initial analyses by the National Research Council and the EPA indicate that the ecological costs of unconventional drilling will be higher than they are for conventional gas drilling.¹ (HVHF is one form of

unconventional drilling and is the process that will be used in the Marcellus Shale.)

No one knows if the gas obtained by HVHF is cleaner than coal, because no one has done a full life cycle analysis of the GHG emissions produced during this process, nor has anyone done a full accounting of other external costs to drilling in the Marcellus Shale.

With 2% fugitive emissions (a low-end estimate), peak GHG emissions from *conventional* gas equal those from coal over 20 years.^{3,4}

Sources of Higher GHG from Unconventional Drilling:²

1) Upstream Combustion of Fossil Fuels (emits various GHGs, including CO₂, SO_x and NO_x):

- **Transportation** uses large amounts of fuel to move equipment, to bring workers to the area and then to work sites, and especially to truck millions of gallons of water to and from each well, every time the well is fracked.
- **Operating drilling, processing and transmission equipment** (especially diesel-powered compressors, drills, pumps, separators, and dehydrators) is fuel-intensive.
- **Flaring of methane** (intentional burning of produced gas) is carried out until a well is capped.
- **Storage and/or treatment of produced water** can only be done at specialized (and thus usually distant) locations. The only thorough method of removing certain toxic chemicals from used frack water is distillation (AKA crystallization of the chemicals), which uses very large amounts of energy.

Using the figures in the draft SGEIS, the number of wells allowed in Tompkins County would generate the equivalent of *516 years of emissions*, at current levels, from *all* other locally-generated sources.⁵

2) Releases of Unburned Methane (which traps 20+ times as much heat as does CO₂)

- **Leaks** can begin during exploration if methane is released from overlying formations; leaks can also result from improper casings, or from migration of produced gas during fracking.
- **Fugitive GHG emissions** are released during capping, processing, compression, transmission, and venting and volatilize from the flowback and produced water.

Ozone levels have gotten so high in the Pinedale, Wyoming area (home of the Pinedale Anticline gas field), that in recent winters they have rivaled the worst bad-ozone days in major cities such as Los Angeles.⁷

3) Destruction of Carbon Sinks⁶

- **Trees and fields are cleared** from thousands of acres for drill pads, holding ponds, gathering lines, treatment and compressor stations, and transmission lines, plus access roads to all of the above.
- **Air pollution, especially ozone**, from compressors and truck traffic slows growth of plants.
- **Soil compacted** by heavy equipment retains less carbon due to the death of plant roots and microorganisms.
- **Water contaminated** by spills of fuel, chemicals, drilling mud, and/or produced water no longer supports plants.

Developed by Margaret McCasland and Ellen Harrison

References and More Information:

1. *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use*, National Research Council, The National Academies Press, October 2009.

“[Unconventional] processes have a considerably greater potential for causing air-quality degradation than do conventional recovery technologies. . . .” p. 84

“Beyond emissions from engines, there are also significant GHG emissions of methane . . . from fugitive emissions. . . .” p.86.

“The prospect of this [Marcellus Shale] gas, however, is balanced against the deeper drilling and more complicated extraction, which would increase the life-cycle energy use and associated emissions of using this resource.” p.91
2. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007*, U.S. EPA, April 15, 2009.

“Over the last two hundred and fifty years, the concentration of CH₄ in the atmosphere increased by 148 percent (IPCC 2007).” p. 20, Executive Summary.

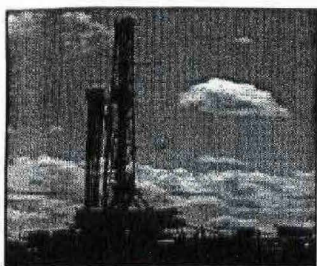
See also Key Categories [of GHG Emissions] Figure ES-16, p. 20, Executive Summary.
3. EPA estimates of the amount of methane leaked in US production is reported by Revkin, A. and Krauss, C. October 14, 2009. “Curbing Emissions by Sealing Gas Leaks.” *New York Times*.
<http://www.nytimes.com/2009/10/15/business/energy-environment/15degrees.html>
4. Lovelock, J. 2007. *Revenge of Gaia*. Basic Books. See pp. 74–76 for the discussion of effective warming from methane.
5. Tompkins County Planning Department comments to NYSDEC, Dec. 2009 accessed on 1/20/2010 at http://www.tompkins-co.org/planning/energyclimate/documents/PlanningDeptcommentsfinal12_30.pdf
6. See, for example “Land Use and Habitat Fragmentation of Oil Sands Production: A Life cycle Perspective,” Jordaan, S., et al. University of Calgary/Institute for Sustainable Energy Environment and Economy, September 2009.

“Methods for the inclusion of landscape fragmentation in life cycle assessment are not well established. . . . The results suggest that land disturbance due to natural gas production can be relatively large per unit energy.” (from abstract)
7. Hargreaves, Steve, Small Town, Big Changes, [CNNMoney.com](http://www.cnnmoney.com), October 20, 2008.

One notable recent report on global warming emissions from natural gas production is *Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements*, Al Armendariz, Ph.D., Southern Methodist University, 2009. In the Barnett Shale in Texas, where high-volume hydrofracking and horizontal drilling are already in use, emissions of carbon dioxide and methane are roughly equal, every day, to the greenhouse gas emissions from two 750 MW coal-fired power plants.

Infrared camera video footage showing hydrocarbon leaks from many different parts of natural gas production can be seen at <http://un-naturalgas.org/weblog/2009/09/782/>.

The Draft SGEIS from NYS DEC contains some estimates of greenhouse gas emissions for Marcellus Shale production (see Chapter 6), but does not use the estimates to make any recommendations.



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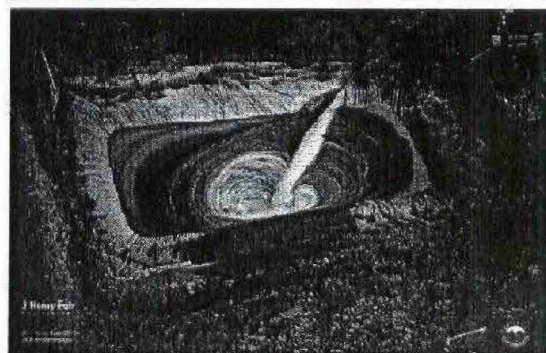
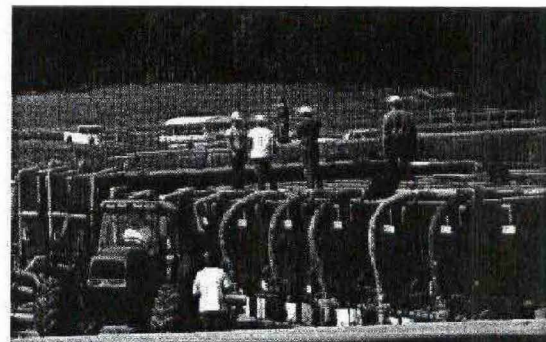
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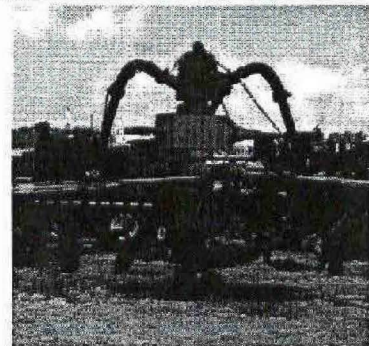
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Ozone levels have gotten so high in the Pinedale, Wyoming area (home of the Pinedale Anticline gas field), that in recent winters they have rivaled the worst bad-ozone days in major cities such as Los Angeles.⁷

3) Destruction of Carbon Sinks⁶

- **Trees and fields are cleared** from thousands of acres for drill pads, holding ponds, gathering lines, treatment and compressor stations, and transmission lines, plus access roads to all of the above.
- **Air pollution, especially ozone**, from compressors and truck traffic slows growth of plants.
- **Soil compacted** by heavy equipment retains less carbon due to the death of plant roots and microorganisms.
- **Water contaminated** by spills of fuel, chemicals, drilling mud, and/or produced water no longer supports plants.

Developed by Margaret McCasland and Ellen Harrison

References and More Information:

1. *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use*, National Research Council, The National Academies Press, October 2009.

“[Unconventional] processes have a considerably greater potential for causing air-quality degradation than do conventional recovery technologies. . . .” p. 84

“Beyond emissions from engines, there are also significant GHG emissions of methane . . . from fugitive emissions. . . .” p.86.

“The prospect of this [Marcellus Shale] gas, however, is balanced against the deeper drilling and more complicated extraction, which would increase the life-cycle energy use and associated emissions of using this resource.” p.91
2. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007*, U.S. EPA, April 15, 2009.

“Over the last two hundred and fifty years, the concentration of CH₄ in the atmosphere increased by 148 percent (IPCC 2007).” p. 20, Executive Summary.

See also Key Categories [of GHG Emissions] Figure ES-16, p. 20, Executive Summary.
3. EPA estimates of the amount of methane leaked in US production is reported by Revkin, A. and Krauss, C. October 14, 2009. “Curbing Emissions by Sealing Gas Leaks.” *New York Times*.
<http://www.nytimes.com/2009/10/15/business/energy-environment/15degrees.html>
4. Lovelock, J. 2007. *Revenge of Gaia*. Basic Books. See pp. 74–76 for the discussion of effective warming from methane.
5. Tompkins County Planning Department comments to NYSDEC, Dec. 2009 accessed on 1/20/2010 at http://www.tompkins-co.org/planning/energyclimate/documents/PlanningDeptcommentsfinal12_30.pdf
6. See, for example “Land Use and Habitat Fragmentation of Oil Sands Production: A Life cycle Perspective,” Jordaan, S., et al. University of Calgary/Institute for Sustainable Energy Environment and Economy, September 2009.

“Methods for the inclusion of landscape fragmentation in life cycle assessment are not well established. . . . The results suggest that land disturbance due to natural gas production can be relatively large per unit energy.” (from abstract)
7. Hargreaves, Steve, Small Town, Big Changes, CNNMoney.com, October 20, 2008.

One notable recent report on global warming emissions from natural gas production is *Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements*, Al Armendariz, Ph.D., Southern Methodist University, 2009. In the Barnett Shale in Texas, where high-volume hydrofracking and horizontal drilling are already in use, emissions of carbon dioxide and methane are roughly equal, every day, to the greenhouse gas emissions from two 750 MW coal-fired power plants.

Infrared camera video footage showing hydrocarbon leaks from many different parts of natural gas production can be seen at <http://un-naturalgas.org/weblog/2009/09/782/>.

The Draft SGEIS from NYS DEC contains some estimates of greenhouse gas emissions for Marcellus Shale production (see Chapter 6), but does not use the estimates to make any recommendations.

Marcellus Revisited

Is Dunkard Creek a foreshadow of our future stream problems?

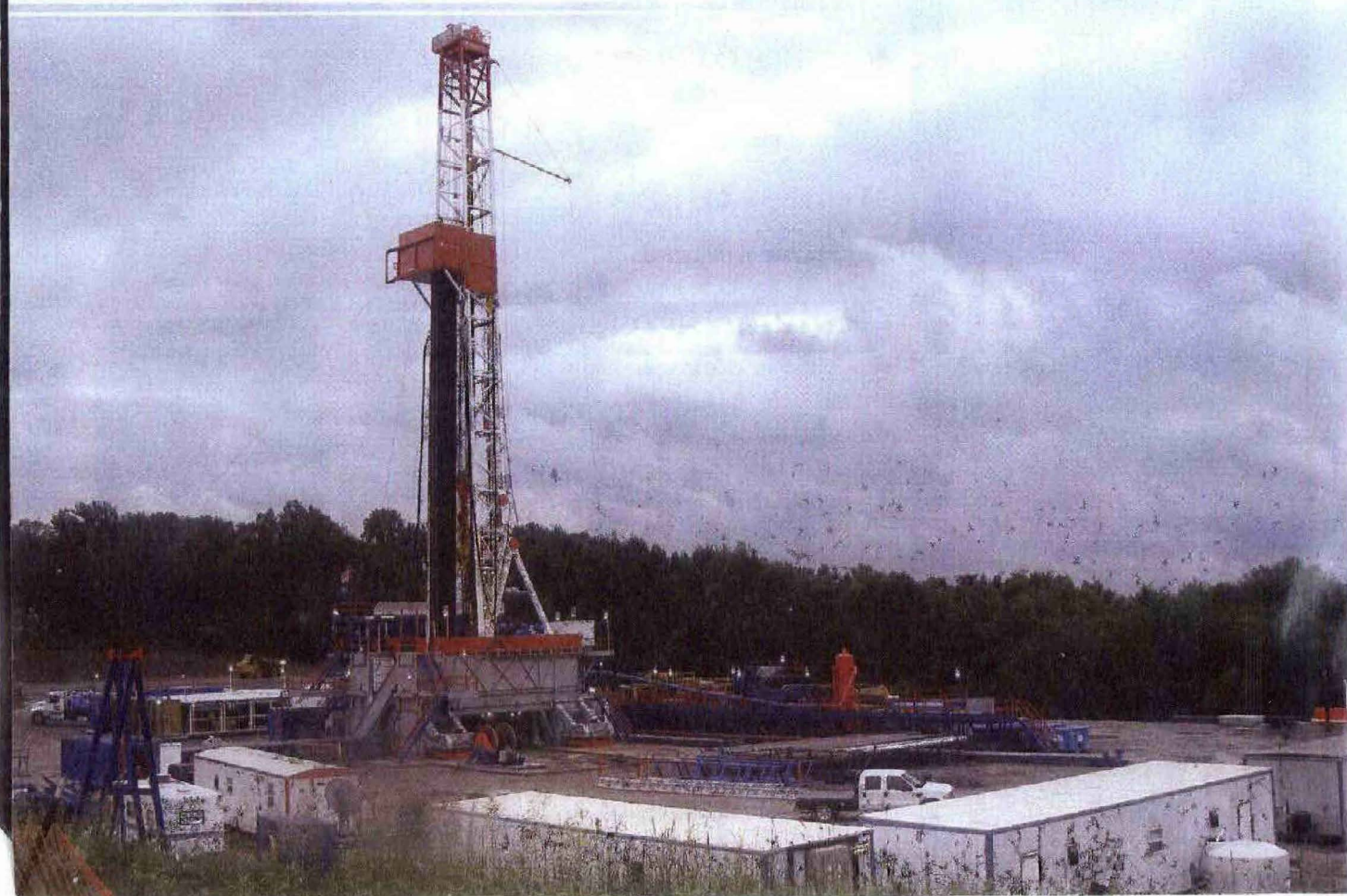
▲ JOHN RANDOLPH

DEBORAH WEISBERG IN this issue's "Stream Watch" [page 16] reports on the issues surrounding the aquatic death of Dunkard Creek in southwest Pennsylvania. Her report is well worth reading if you care about the future of Pennsylvania and New York streams. They lie in the geologic overlay of the Marcellus Shale formation where impending industrial drilling and "fracturing" with high-pressure water and chemicals will produce wastewater that both states are poorly equipped to treat.

Marcellus drilling activity slowed briefly last year due to a downturn in the economy and the price of natural gas, but gas prices inevitably have begun to rise again and the investment monies in exploration are in place and waiting to stoke the most massive and swift industrial development of a hydrocarbon since coal and oil were exploited in the 19th century. As recently as Jan. 13, 2010, Pennsylvania announced winning bids by five companies totalling \$128 million to drill on 32,000 acres of state forest lands. The state will also take 18 percent of production royalties.

► Exploration and production of Marcellus Shale natural gas threatens Pennsylvania and New York State trout streams.

Photo | Stephen Kepler/PA Fish & Boat Commission



Fishermen endorse the development; they just want it done responsibly, without long-term damage to the trout streams and the drinking water. We are just beginning to recover our streams from the last industrial juggernauts—logging and coal mining.

Weisberg's report indicates that human, animal, and fish problems in the Dunkard Creek area are under investigation by the Pennsylvania Department of Environmental Protection (PADEP) and the attorney general's office for possible charges of illegal dumping of toxic wastewater.

The PADEP points out that the high salinity in Dunkard, and the alien golden algae that thrives only in salty water, could have been caused by mine drainage, an historic source of mine acids and salts in that area and across Pennsylvania.

However, the environmental advocacy group PennFuture says PADEP may have caused the Dunkard Creek wipeout by ignoring its aquatic experts' recommendations to require reductions in PADEP-permitted coalmine waste-dumping into Dunkard Creek.

The recommendations were ignored by PADEP's mining program office and the waste dumping into the creek actually *increased in volume* under the permit. The salt levels in the creek water skyrocketed, killing fish and all other stream life. For a complete account of this debacle, see *pennfuture.org* (pennfuturefacts, Vol. 12, No. 1).

The regulation and enforcement of natural gas development in Pennsylvania and New York is complex, and possibly headed for a train wreck. Here's why.

Facts we Know

According to a report from Pro Publica—an independent nonprofit New York City newsroom that produces journalism in the public interest—Pennsylvania's oil and gas wells currently produce 9 million gallons of wastewater per day (mgd) and that figure will jump to 19 mgd by 2011.

The first treatment plant in the state capable of removing total dissolved solids (tds) from Marcellus wastewater won't be ready until 2013 and will have a peak capacity of 0.4 mgd.

In the summer of 2009, workers at a steel mill and a power plant on the Monongahela River reported that the water used to power their plants contained so much salty sediment that it was corroding their machinery.

PADEP concluded that the river's water had been contaminated by wastewater from the natural gas industry, probably dumped into municipal or industrial treatment plants and thence into the river. PADEP "solved" the problem by having upriver dams dump extra water to dilute the pollution, and afterward required treatment plants to reduce the volumes of gas wastewater that they handled.

Wastewater Volumes

According to research done by the consulting firm Hazen and Sawyer for New York City DEP in their (Dec. 2009) "Final Assessment Report on Potential Impacts of Natural Gas Production in the New York City Water Supply Watershed," (http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/12_23_2009_final_assessment_report.pdf) 6,000 fracking wells will consume 1 million tons of fracking chemicals without refracking, and 24,000 wells will require 4 million tons with refracking over a 10-year interval and 48,000 wells with refracking will require 8 million tons. [*Refracking is the process of fracturing the shale formation a second time to release more natural gas.* THE EDITOR.]

The frack chemicals represent only 1.0% of total fracking fluids. The frack water volumes range from 4mgd per frack job to between 5.5mgd and 8.2mgd per frack job with 10-year interval refracturing and 1.7mgd to 14.2mgd/job for 5-year-interval refracturing. Waste tonnages of total dissolved solids (TDS) from the 6000 wells range from (at 100,000mg/liter) 12.5 million tons (without refracturing) to 27.5 million tons with 10-year refracturing and 47.5 million tons with 5-year refracturing.

The report warns that there has been no industrial development in the Catskill New York City water supply region since the supply system reservoirs were constructed in the late '50s to '70s. Exploration and production of the Marcellus Shale natural gas could put the city's water supply at risk.

The drilling and fracking could compromise (or collapse) the city's 120-mile tunnel system that takes water from the west slopes of the Catskills to the east slopes and thence under the Hudson River to New York City.

The report warns that massive road and wellpad construction accompanied by heavy 18-wheeler traffic to transport gas and wastewater could

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"There is no way the state can handle the huge volume of toxic wastewaters that Marcellus drilling will produce ..."

pose a threat to the reservoirs, where roads run adjacent to the water. Reservoir water could be threatened if a truck carrying toxic wastewater crashes and dumps into the water.

The report also says that fracking gases can travel along deposit formation cracks and pollute home and municipal water supplies. Conservationists point out that such contaminations have occurred already in Pennsylvania and other states such as Louisiana, Texas, Wyoming, and Colorado.

The water and chemical tonnage figures per well in the Hazen-Sawyer report also apply to projected Pennsylvania Marcellus gas wells. They are derived from historical fracturing operations in other regions of the country, where shale-fracturing operations are conducted.

The tonnages and water volumes are huge by any simple arithmetic, and they define the true nature of the Marcellus conundrum: In their current financial pinch, Pennsylvania, New York, and West Virginia dearly want the revenues from Marcellus natural gas, but no state is equipped to handle the toxic wastewaters while eliminating tds, or will be able to do so in the near future.

Treatment plants that can handle elimination or reduction of total dissolved solids (a gritty mixture of drilling wastewater comprised of salt and other minerals that can be as much as five times saltier than sea water) must be constructed or retrofitted, and there is no money to build this infrastructure.

Marcellus drilling and production is underway and wastewaters are flooding forth and demanding treatment. The Marcellus drilling industry is looking to the states for answers to their problem. They say: "No wastewater treatment facilities; no industry. No industry; no revenues to the state or jobs to jumpstart the economies."

PADEP says it has approved permits for 30 existing municipal treatment

plants to handle Marcellus waste waters, but only one will be ready to handle the wastewater tds in 2013. Gas industry spokespeople say their studies show that the existing tds contaminations of the Pennsylvania streams comes historically from abandoned coal mines, and most streams can handle higher levels of tds. PADEP chief John Hanger says his agency's highest priority is Pennsylvania water quality and the plants will be ready to handle the wastewaters.

PADEP spokesman Tom Rathbun says Pennsylvania can "control where, when, and how much water withdrawals are made from all the streams and rivers of Pennsylvania under our new water-management plan. The controls are included in the permitting process. We understand that stream flows are seasonal and we will not allow water withdrawals when stream low flows could result in damage to stream life."

Rathbun points out that PADEP ideally would like to see on-site processing and recycling of drilling wastewaters (especially on smaller streams in fragile ecosystems) and some sites in Pennsylvania already use this technology.

He also points out that well-site infrastructure inspections are a high priority for PADEP. The sites, if not inspected regularly, can be a high source of environmental damage to streams and wetlands.

However, Pennsylvania Trout Unlimited President Dave Rothrock says, "There is no way the state can handle the huge volumes of toxic wastewaters that Marcellus drilling will produce, especially the total dissolved solids, which pose the greatest threats to streams and humans. Many of the rivers that run above the Marcellus deposits are already at or above their allowed tds loads and can take no more. The West Branch [Susquehanna] is a prime example.

"In addition, there are not nearly enough PADEP enforcement officials

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or inspectors to complete permitting; police drilling, water withdrawals, and trucking operations; and examine treatment plants every two years to assure that the waters of the state are not being destroyed. Despite the addition by PADEP of 27 new enforcement agents, some 90 PADEP positions have been cut due to the economy, and without a tax on Marcellus gas there will be no money to finance the infrastructure build-out that the state will need to handle the wastewaters."

NYC Water Threatened

On Dec. 31, 2009, New York State Council of Trout Unlimited Chairman Ron Urban submitted a strongly worded critique of the New York State Department of Environmental Conservation's (NYSDEC) draft Supplemental Generic Environmental Impact Statement (dSGEIS) on "Oil, Gas and Solution Mining Regulations: Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low Permeability Gas Reservoirs"

(Sept. 30, 2009). The dSGEIS was requested by a New York State congressman following complaints from upper Delaware fly fishers who became aware of drilling permits being issued for the upper river. The governor of New York declared a temporary moratorium on the issuance of drilling permits until the dSGEIS could be completed.

The TU critique of the dSGEIS was strong, noting that fisheries issues were inadequately addressed, or not addressed at all, and were without specifics on how to prevent drilling and water withdrawals on small streams, particularly in the region's unspoiled headwaters, home to remnant strains of threatened Eastern brook trout.

Urban said the dSGEIS "should supplement its natural flow regime methodology with a limit on withdrawals" to "protect streams from large withdrawals that take a significant percentage of a [small] stream's flow."

The TU critique was accompanied by a "Broad-Scale Analysis of the Potential Impacts of Proposed Marcellus and Utica Shale Developments on

Eastern brook trout in the State of New York," written by Amy L. Haak, Ph.D., resource information director for Trout Unlimited, outlining the severe historic decline of brookies in the East and in particular New York State, with detailed maps outlining the remaining intact brook trout drainages. The comments went to the New York Bureau of Oil & Gas Regulation, author of the dSGEIS.

Park Service Objects

Also on Dec. 31, 2009, the U.S. National Park Service commented strongly on the dSGEIS, contending that protection for the many federal parks lying within the New York Marcellus Shale region was not addressed, and many of those parks could be impacted by road-building, drilling, wastewater, trucking, noise pollution, and interferences with outdoor recreational activities, including the upper Delaware Scenic and Recreational River, five national natural landmarks, the North Country National Scenic Trail, and many more.



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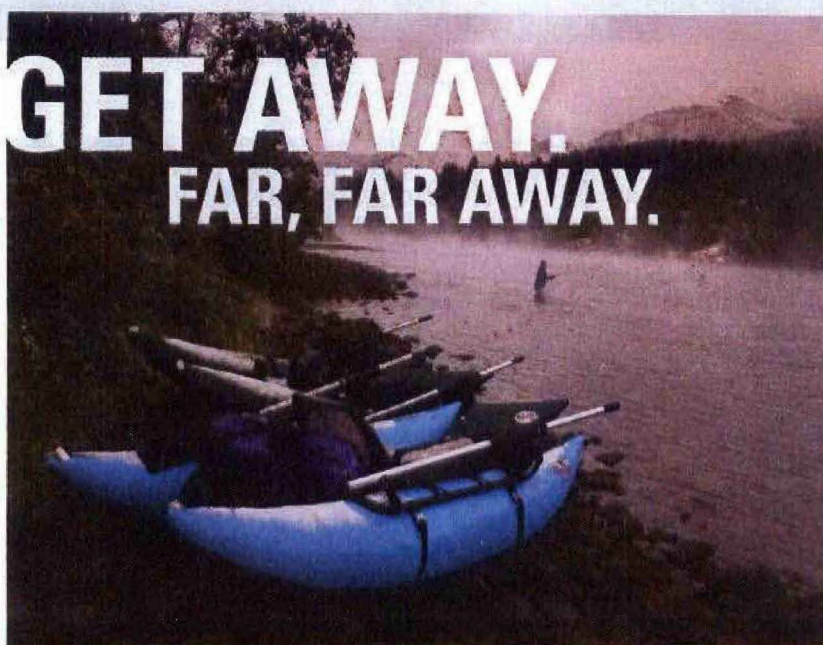
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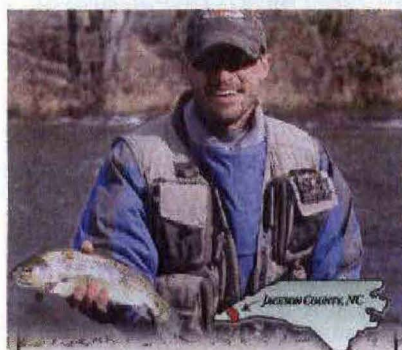
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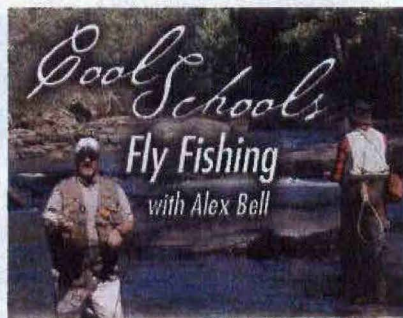
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The comments concluded, after a thorough evaluation of what little is known on projected Marcellus Shale development, that: "The National Park Service is concerned with the potential impacts of NPS-managed lands and other NPS-related areas from development of the Marcellus Shale natural gas resource.

"We believe that the environmental and socioeconomic effects associated with the relatively new practice of hydraulic fracturing and large-scale, industrial development anticipated for the Marcellus Shale region are not yet fully understood. Consequently, the findings of the draft SGEIS may not adequately anticipate the severity of impacts.

"We urge the state to err on the side of caution and require site-specific SEQR determinations to adequately analyze potential impacts from Marcellus Shale operations that may effect units of the National Park System or other NPS-related areas."

EPA Concerns

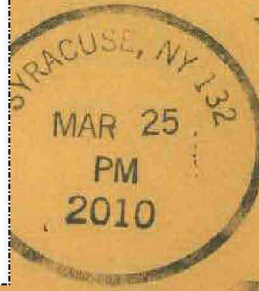
The National Park Service's environmental worries about Marcellus Shale were expanded by comments on the dSGEIS by the U.S. Environmental Protection Agency (EPA), calling for significant analysis on cumulative and indirect impacts on the environment and potential long-term health risks for humans that were not addressed, and also the potential threats to the New York City water supply.

The EPA wants cooperative efforts between state and federal environmental agencies "to satisfy the requirements of the State Environmental Quality Review Act (SEQRA) for NYSD-DEC to review and process permit applications for horizontal drilling and hydraulic fracturing of natural gas bearing shales, including Marcellus Shales."

The wastewater conundrum has not been solved by either Pennsylvania or New York. Nor have the threats posed by potential water withdrawals from fragile small streams (the last bastions of brook trout) in both states. Rothrock has it right: "If we don't school our Trout Unlimited members to become onstream whistle-blowers and watchers, we may well lose what's left of our precious heritage—our trout streams."

John Randolph is publisher emeritus of FLY FISHERMAN.

Ex. 6 - Personal Privacy



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